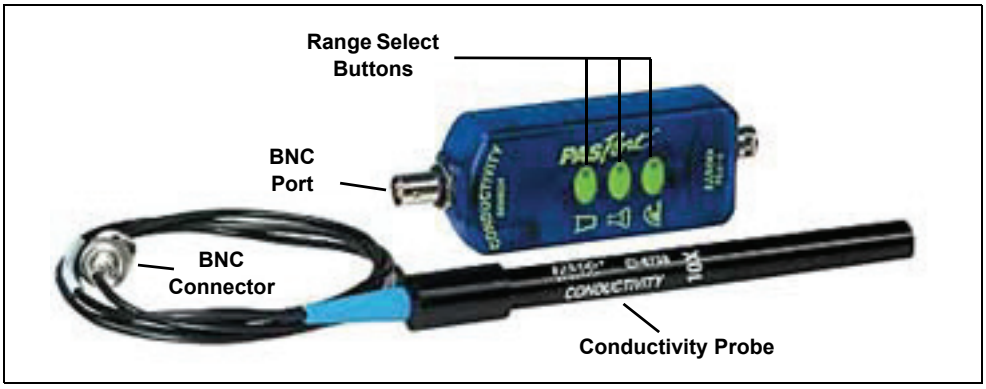
Conductivity Sensor

PS-2116A



Included Items
Conductivity Sensor
10X Conductivity Probe (PS-2571)

Required Items*
PASCO Interface
PASCO Data Acquisition Software

**See the PASCO catalog or the PASCO web site at www.pasco.com for more information.*

Recommended Item*
Sensor Extension Cable (PS-2500)

Introduction

The PS-2116A Conductivity Sensor measures ionic and non-ionic molecules in aqueous solutions. These measurements can be used to investigate factors that influence the electrical conductivity of liquids. This sensor can be used to explore the effects of temperature and concentration on the electrical transport properties of aqueous solutions. The Systeme International (SI) unit) for conductivity is the siemen per centimeter (S/cm). When dealing with a chemical solution ranging from extremely dilute to very concentrated chemical, use of conductivity units of µS/cm and mS/cm are common. In these applications, conductivity has the advantage of an almost direct relationship with impurities, especially at low concentration.The sensor has three ranges.

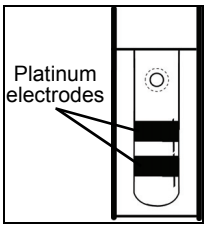
The sensor is designed to work with a PASPORT-compatible interface (such as the UI-5100 850 Universal Interface) and PASCO data acquisition software (such as PASCO Capstone) to measure electrolytic conductivity.

The 10X Conductivity Probe can be replaced if necessary.

Sensor Theory

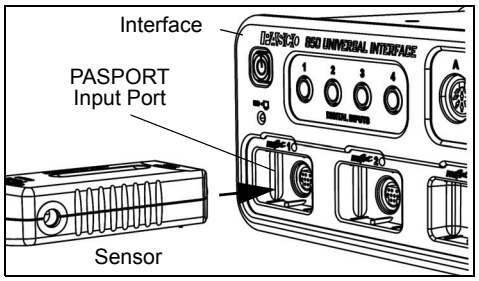
Conductance is the reciprocal of resistance. Conductivity is the *specific* conductance of a material. The conductivity is the conductance measured between the opposite faces of a one centimeter cube of the material.

The electrode cell in the end of the Conductivity Probe is constructed of an insulating material embedded with pieces of platinum. These metal contacts serve as sensing elements and are placed at a fixed distance apart.



Setup the Sensor

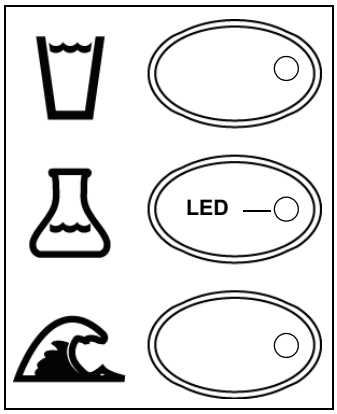
- Soak the end of the probe in deionized or distilled water for five to ten minutes.
- Connect the BNC Connector of the Conductivity Probe to the BNC Port on the sensor.
- Plug the sensor into one of the PASPORT input ports of a PASCO PASPORT-compatible interface.



NOTE: If more distance is needed between the sensor and the interface, plug the sensor into a Sensor Extension Cable (optional) and then plug the cable into the interface.

Select a Range

The three ranges are represented by the icons next to the range select buttons. The water glass range is 0 to 1000 microsiemens per centimeter, the chemistry flask range is 0 to 10,000, and the ocean wave range is 0 to 100,000.



To select a range, press one of the Range Select Buttons on the sensor. The green light emitting diode (LED) for that button will shine.

The sensor continuously monitors conductivity, even if data are not being recorded. It detects when the conductivity level is too high for the selected range. When this occurs, the LED for the selected range will blink, and the LED in the button for the next higher range flashes. Press the button with the flashing LED to select the proper range.

Solution	Conductivity
Ultra-Pure water	0.05 µS/cm
Distilled water	0.5
Drinking water	50 to 1500
Sea water	53,000
Brackish water	1000 to 80,000

Safety CAUTION!

Always use eye protection, gloves, and an apron when working with chemicals.

Making Measurements

Using PASCO Capstone Software

- Start the PASCO data acquisition software.
- Click the “Hardware Setup” icon in the Tools palette to open the “Hardware Setup” panel. Confirm that the sensor’s icon appears with the interface’s icon.
- Click one of the display templates in the Capstone workbook page, or double-click an icon in the “Displays” palette to open a specific data display.
- Click “Record” ( ) to begin recording data.

Using SPARKvue Software

- Connect the sensor to a SPARKvue-compatible interface and start the software. The sensor parameter screen opens and shows the list of measurements for the sensor.
- In the sensor parameter screen, touch the measurement, and then touch ‘Show’ to open a graph display of the measurement.
- Touch “Start”( ) to begin recording data.

Using the Xplorer GLX

- Turn on the Xplorer GLX and connect the sensor to a port on the top. A Digits display of conductivity opens automatically and shows the data being monitored.
- Press the **Start/Stop** key ( ) to begin recording data. Press the same key again to stop recording.

Calibration Information

See the Appendix for detailed information about calibrating the Conductivity Sensor.

More Information

For more information about collecting, recording, displaying and analyzing data, refer to the User’s Guide or Online Help System for the data acquisition software.

Specifications

Item	Value
Ranges:	0 to 100 µS/cm 0 to 10,000 µS/cm 0 to 100,000 µS/cm
Accuracy:	±10% of full range for all ranges
Resolution:	0.1% or better
Operating Temperature:	0 to 50° C

Maintenance

Cleaning

The electrode cell in the end of the Conductivity Probe must be clean for accurate and reproducible results. A dirty electrode cell will contaminate the sample being tested.

The electrode cell can be cleaned with detergent or dilute nitric acid (1%) by stirring the end of the probe in the cleaning solution for three minutes. Rinse thoroughly.

Storage

The best method for storing the Conductivity Probe is to immerse the end of the probe in deionized or distilled water.

However, the Conductivity Probe can also be stored dry. If the probe is stored dry, it should be soaked in deionized or distilled water for 5 to 10 minutes before use.

Suggested Activities

- Concentration Dependence of Conductivity in Aqueous Solutions
- Temperature Dependence of Conductivity in Dilute Aqueous Solutions
- Acid-Base Titration with the Conductivity Sensor

More Information

For the latest information about the Conductivity Sensor, visit www.pasco.com and enter "PS-2116A" in the Search window.

Technical Support

For assistance with any PASCO product, contact PASCO at:

Address: PASCO scientific
10101 Foothills Blvd.
Roseville, CA 95747-7100

Phone: +1 916-462-8384 (worldwide)
877-373-0300 (U.S.)

E-mail: support@pasco.com

Web www.pasco.com

Product End of Life Disposal Instructions:

This electronic product is subject to disposal and recycling regulations that vary by country and region. It is your responsibility to recycle your electronic equipment per your local environmental laws and regulations to ensure that it will be recycled in a manner that protects human health and the environment. To find out where you can drop off your waste equipment for recycling, please contact your local waste recycle/disposal service, or the place where you purchased the product.

The European Union WEEE (Waste Electronic and Electrical Equipment) symbol (to the right) and on the product or its packaging indicates that this product must not be disposed of in a standard waste container.

Appendix: Calibration

Before calibration, soak the Conductivity Probe in deionized or distilled water for five to ten minutes.

To make a standard conductivity solution for calibration, sodium chloride (NaCl), deionized water (1 liter), a 1-liter flask, a mass balance, and a stir rod are needed.

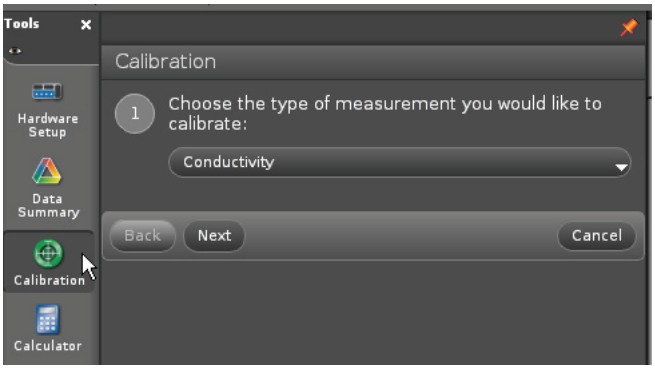
- Prepare one of the weight percent sodium chloride (NaCl) solutions given in the table below. Weigh out the desired mass in milligrams and place the salt in a 1-liter flask. Add 500 milliliters (ml) of deionized water and stir the solution to dissolve the salt. Add the remaining 500 ml of deionized water and stir the solution again.

% Weight	Mass of NaCl (mg)	Conductivity (μS/cm) at 25°C
0.001	10	21.4
0.01	100	210
0.1	1,000	1,990
1.0	10,000	17,600
10.0	100,000	140,000

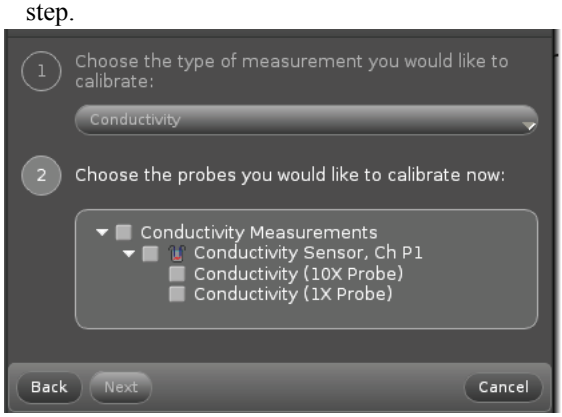
- After preparing the standard conductivity solution, put the end of the Conductivity Probe into the solution.

Calibration: PASCO Capstone

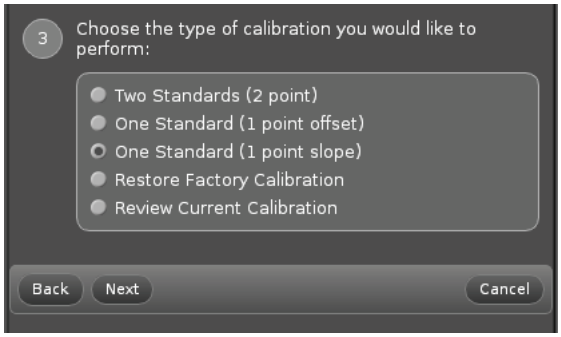
In the PASCO Capstone software, click the "Calibration" icon in the Tools palette to open the "Calibration" panel.



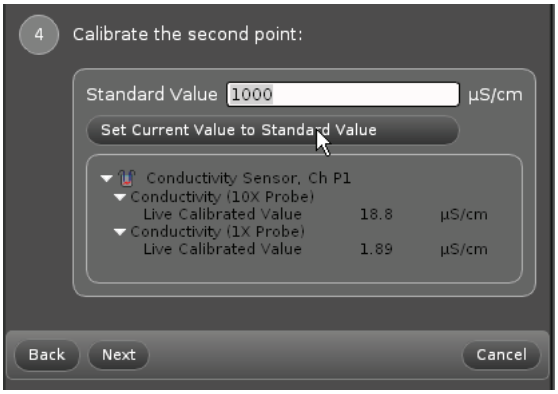
- In Step 1, the measurement of "Conductivity" is automatically selected. Click "Next" to open the second step.



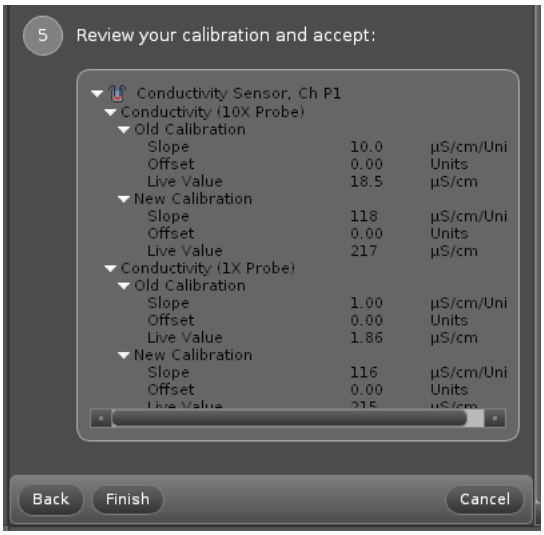
- In Step 2, chose what to calibrate. Click the check-box next to "Conductivity Sensor". Then, click "Next" to open the third step.



- In Step 3, choose the type of calibration. The default choice is "One Standard (1 point slope)". Click "Next" to open the fourth step.



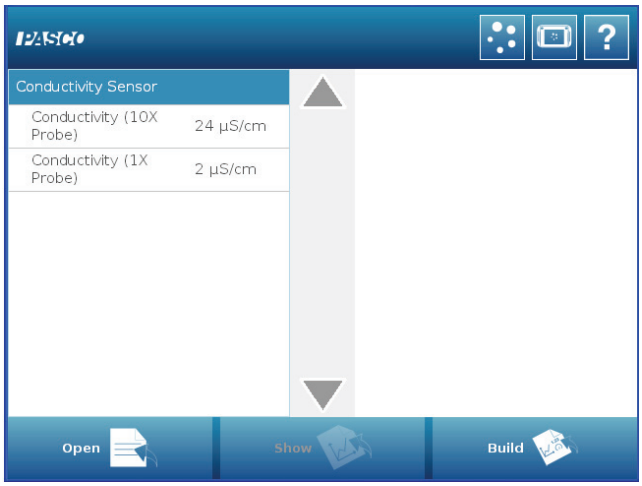
- In Step 4, enter the conductivity value of the standard conductivity solution in the "Standard Value" text area. For example, if the standard conductivity solution has a value of 210 (see the table above), then enter 210 as the Standard Value. Click "Set Current Value to Standard Value" and then click "Next" to go to the last step.



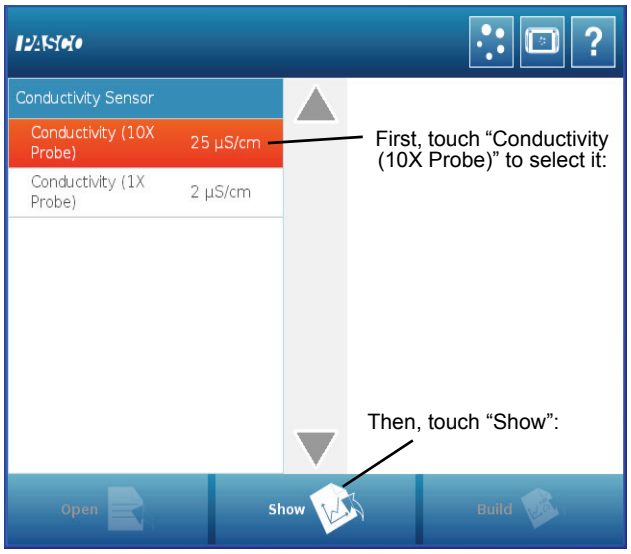
- The Calibration panel shows the calibration information. In Step 5, check that the calibration information is acceptable. Then, click "Finish".
- The Calibration panel returns to Step 1. Click the "Calibration" icon in the Tools palette to close the panel.

Calibration: SPARKvue

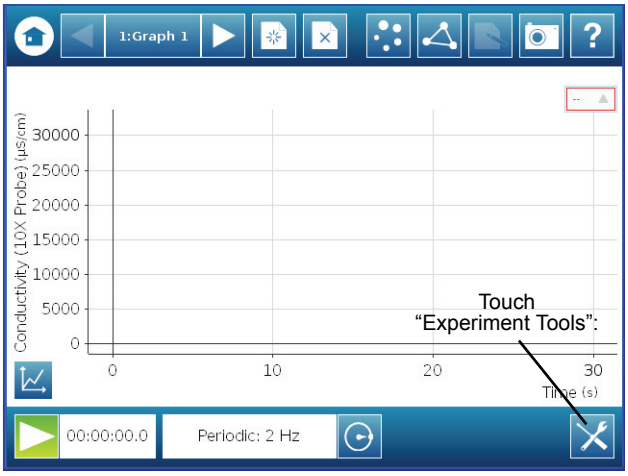
Turn on the SPARK SLS hand-held datalogger. Connect the Conductivity Sensor to one of the PASPORT input ports on the SPARK SLS. The sensor parameters screen for the Conductivity Sensor opens.



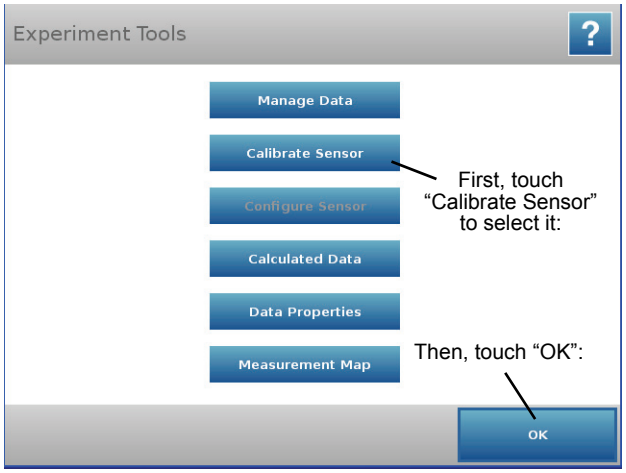
- In the Conductivity Sensor screen, touch “Conductivity (10X Probe) to select that choice, and then touch “Show”.



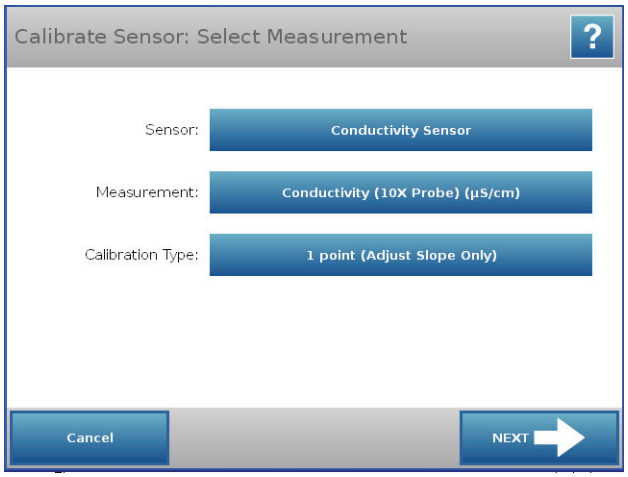
- A graph display of Conductivity and Time opens. Touch the “Experiment Tools” icon in the lower right corner.



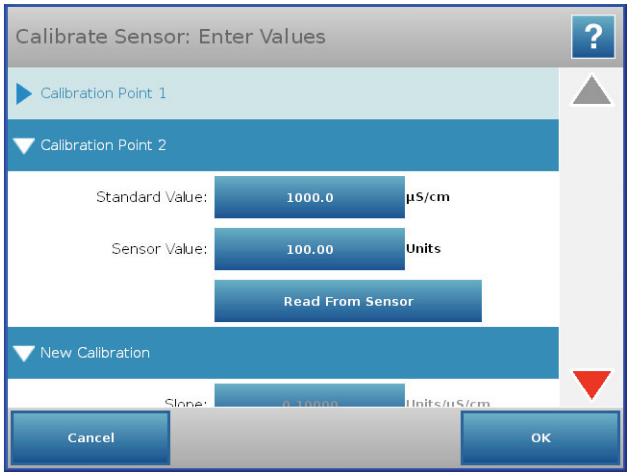
- The “Experiment Tools” screen opens. Touch “Calibrate Sensor” to select that choice and then touch “OK”.



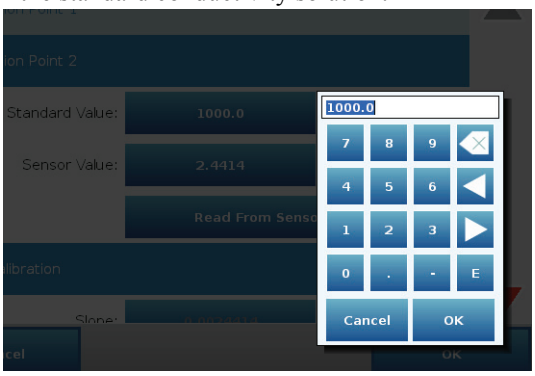
- The “Calibrate Sensor: Select Measurement” screen opens. and the default selections are “Conductivity (10X Probe) (µS/cm)” as the “Measurement” and “1 point (Adjust Slope Only)” as the “Calibration Type”. Touch “NEXT”.



- The “Calibrate Sensor: Enter Values” screen shows the “Calibration Point 2” menu.



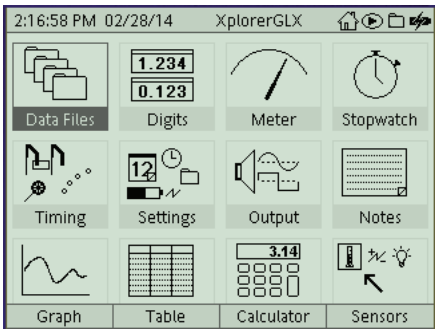
- Touch “Standard Value:” to open the keypad. Use the keypad to enter the standard value for the conductivity of the standard conductivity solution.



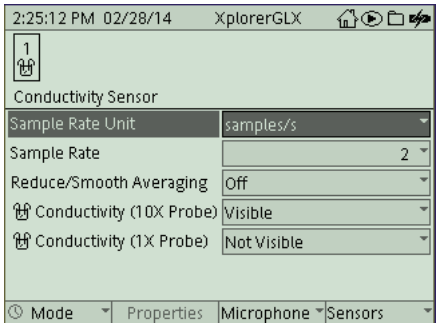
- When the number is entered, touch “OK” on the keypad to return to the “Calibrate Sensor” screen. Touch “OK” to finish the calibration.

Calibration: Xplorer GLX

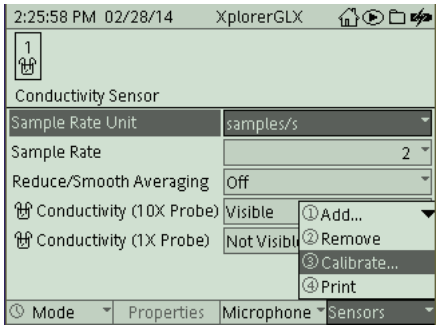
Turn on the Xplorer GLX hand-held datalogger. Connect the Conductivity Sensor to one of the PASPORT input ports on the GLX. Press the **Home Screen** key ( ).



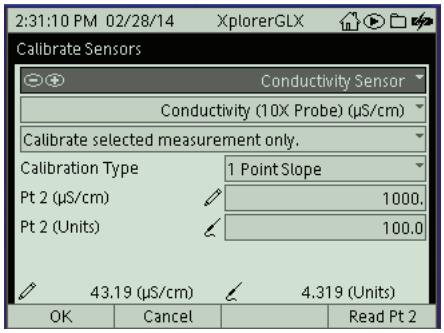
- On the keypad, press **F4** ( ) to open the **Sensors** screen for the Conductivity Sensor.



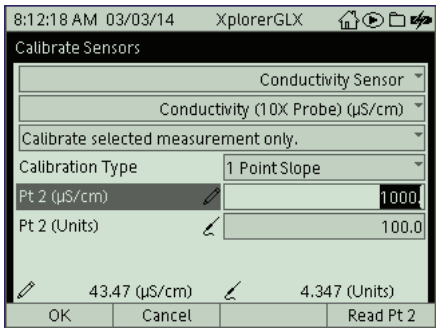
- On the keypad, press **F4** ( ) again to open the **Sensors** menu. Use the down arrow key ( ) to select "Calibrate" from the menu.



- In the **Calibrate Sensors** screen, the highlighted selection is "Conductivity Sensor" and the choice for Calibration Type is "1 Point Slope".



- Use the down arrow ( ) to highlight the "Pt 2 (µS/cm)" text area.



- Use the numeric keypad to enter the value of the standard conductivity solution. Press **F1** ( ) to select "OK". Press the **Home Screen** key ( ) to return to the Home Screen.

Sources of Conductivity Data

Environmental Chemistry: Air and Water Pollution (2nd ed.), H. Stephen Stover and Spencer L. Seager, Scott Foresman and Company, Glenview, Illinois, 1976.

International Critical Tables, Vol. VI, pp. 230 - 258, McGraw Hill, 1929.

Handbook of Chemistry and Physics, 78th Edition, CRC Press, 1997.

Electrolyte Solutions, Robinson and Stokes, Butterworths, 1959.